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ABSTRACT

This paper reports the results of an empirical examination of the effects of personal experience and social interaction on individual knowledge and performance in a specific decision making task context. The study revealed a differential effect of increased experience on the quality of participants' decisions. In particular, increased experience did not result in significant decision improvement in the non-interactive social environment, but did so in the interactive social environment. The study also revealed that social interaction was beneficial irrespective of personal experience, and led to better performance at both low and high experience levels. The results suggest that individuals may benefit from, in combination, opportunities for personal experimentation and social interaction with others. These results may be useful to all those responsible for planning knowledge management strategies aimed at enhancing knowledge creation and utilization. Includes two tables and one figure. (Contains 48 references.) (Author)

# THE ROLE OF PERSONAL EXPERIENCE AND SOCIAL INTERACTION IN KNOWLEDGE CREATION AND UTILISATION



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*This paper reports the results of an empirical examination of the effects of personal experience and social interaction on individual knowledge and performance in a specific decision making task context. The study revealed a differential effect of increased experience on the quality of participants' decisions. In particular, increased experience did not result in significant decision improvement in the non-interactive social environment, but did so in the interactive social environment. The study also revealed that social interaction was beneficial irrespective of personal experience, and led to better performance at both low and high experience levels. The results suggest that individuals may benefit from, in combination, opportunities for personal experimentation and social interaction with others. These results may be useful to all those responsible for planning knowledge management strategies aimed at enhancing knowledge creation and utilisation.*

## INTRODUCTION

Information and knowledge management literature repeatedly report that despite large investments and proliferation of programs to improve individual and organisational performance, failed programs far outnumber successes and improvement rates remain low (Garvin 1998; Sauer, 1993; Swanson, 1988). It has been claimed that it is because these companies failed to grasp the basic truth, that before people or organisations can improve they first must learn. The literature suggests that to remain competitive, or even to survive, in today's uncertain economy with shifting markets, proliferating technology, multiple competitors and shortening product life, companies will have to convert themselves into "learning organisations (Garvin, 1998), "knowledge-creating organisations (Nonaka, 1998), and "organisations of knowledgeable specialists (Drucker, 1998).

While there seems to exist a growing recognition of the importance of learning and knowledge for competitive advantage or survival (Devenport & Prusak, 1998; Davenport et al., 1998; Drucker, 1993; Grayson & Dell, 1998; Stewart, 1997), the complexities of learning and the large number of interacting factors which affect individual and organisational learning present many challenges. Scholars define learning organisation as skilled at creating, acquiring and transferring knowledge and modifying its behaviour accordingly (Garvin, 1998); as a place where people continually expand their capacity to create desired results, new thinking patterns are nurtured, collective aspirations are set free and people learn how to learn together (Senge, 1990); and a place where inventing new knowledge is a way of behaving or being, and in which everyone is a knowledge worker (Nonaka, 1998). Some authors suggest that the typical organisation of tomorrow will resemble a symphony orchestra or the university in

which professional specialists will direct and discipline their own performance (Drucker, 1998).

It is argued that any company that wants to compete on knowledge must learn techniques of knowledge creation. Some clues as to what knowledge-based organisations will require may come from other knowledge-based entities (e.g. university or symphony orchestra). Western theorists have been recently criticised for having too narrow view of organisation and knowledge (Nonaka, 1998). They tend to consider organisation as an information-processing machine and focus mostly on hard information stored in organisational codified repositories as a main source of "explicit objective and systematic knowledge. Japanese theorists, on the other hand, recognise the importance of "tacit knowledge that people gain through experience and sharing (Nonaka & Takeuchi, 1995). Considering that between 40% (AAOTE, 1998) and 90% (Hewson, 1999) of the needed knowledge in organisations is tacit, it is not surprising that there is a growing interest among the practitioners and academics alike to better understand how to tap into the wealth of knowledge in people's heads.

It has been suggested that new knowledge always begins with the individual, and that making personal knowledge available to others is the central activity of the knowledge-creating company. The spiral knowledge model (Nonaka & Takeuchi, 1995) assumes that the process of sharing will result in the organisational amplification and exponential growth of working knowledge. Furthermore, it has been suggested that in order to build learning organisation the first step should be to foster an environment conducive to individual learning, that is allow experimentation and time to gain experience, and second, to open up boundaries and stimulate exchange of ideas (Garvin, 1998). Yet, little is known of the ways in which tacit knowledge is actually acquired and shared, conditions under which this occurs, and the impact it has on performance (Baxter & Chua, 1999).

It is important to recognise the value of knowledge and the need for better understanding of the potential of various knowledge-management initiatives to support knowledge creation. The main purpose of this study is help to provide an insight into two specific initiatives (opportunities for personal experience and social interaction) aimed at promoting individual knowledge in a decision-making context. Decision-making is regarded as a knowledge intensive activity. Decision-makers often gain knowledge of and ability to implement strategies on the task from experience gained through task repetition and from feedback. Their work also involves a significant amount of social interaction with their subordinates, peers and superiors. With the growing importance of fostering learning and sharing of personal knowledge in modern organisations it is of interest to examine two things in particular. Firstly, whether personal experience gained in iterative decision contexts may affect individual decision makers' working knowledge and what impact this may have on the quality of their subsequent decisions. Secondly, what effects might social interaction with other knowledge workers have on the quality of these same decisions.

## PRIOR RESEARCH

The following review presents and discusses relevant past theoretical and empirical literature on the impact of personal experience and social interaction on various aspects of individual decision-making, and develops specific research questions of interest for the present study.

### Personal Experience

Learning theorists suggest that people should learn from experience gained through task repetition and from feedback to adjust their behaviour and improve performance over time. In decision making, some authors (Payne et al., 1988) claim that adaptivity may be crucial enough to individuals that they would guide themselves to it without the need for an external prod. Other authors (Hogarth, 1981) believe that the availability of immediate feedback, in addition to the opportunity to take corrective action, is critical for effective learning. Adequate feedback is considered especially important for the correct assessment of the previous responses in situations where the subject is unfamiliar with the task or topic (O'Connor, 1989).

Empirical studies indicate mixed findings. Some studies reported modest learning from experience in a series of judgement tasks in which participants were provided with multiple pieces of information of varying accuracy at a cost (Connolly & Serre, 1984; Connolly & Gilani, 1982; Connolly & Thorn, 1987). Behavioural patterns of real participants were consistent with computer simulation and resulted in improved effectiveness with experience. Although the improvement was real, a serious deviation from optimality remained. In contrast, a study conducted in a similar multivariate judgement task reported no learning at all (Connolly & Wholey,

1988), while the results of a judgemental adjustment study (Lim & O'Connor, 1996) indicated that information strategy even worsened and consequently performance declined over time. Many studies performed in the multiple cue probability learning (MCPL) paradigm have concluded that people can not learn when multiple cues are involved or non-linear relationships exit (for review see Brehmer, 1980).

It has been suggested that feedback may enhance learning by providing an information about the task, task outcome, individual's performance and/or decision process. From this information, through task repetition, an individual may learn to adapt, ie. maintain, modify or abandon strategy to improve task performance. In his review of a number of laboratory and field studies on the impact of feedback on task performance, Kopelman (1986) reported that objective feedback (defined as information about task behaviour or performance that is factual and inconvertible), had a positive effect on performance. But it was stronger and more sizeable in the field than in laboratory. In choice task setting, Creyer et al. (1990) speculated that for an individual to adapt decision strategy to a particular decision task, he or she had to have at least some vague ideas about the degree of effort and accuracy characterising his or her decision process. They examined how decision-makers learned to adapt when presented with explicit accuracy feedback and/or explicit effort feedback. The results indicate that feedback on accuracy led to more normative-like processing of information and improved performance. The role of accuracy feedback was greater when the decision problem was more difficult. Explicit effort feedback, on the other hand, had no impact on processing or performance regardless of the difficulty of the problem.

In contrast, findings from MCPL studies with feedback reported by Klayman (1988) indicate that people have difficulties learning from outcome feedback in these tasks, but they can learn more effectively when they are provided with cognitive feedback, such as summary analysis of how their past predictions differed from optimal. Feedback was found to have induced learning in the so-called cue discovery tasks. People were found to perceive the existence and direction of a cue-criterion relation, but have difficulties in learning its shape. A significant improvement in predictive success over time was attributed to cue discovery rather than accurate weighting.

In a recent study examining the impact of several types of feedback on the accuracy of forecasts of time series with structural instabilities, Remus et al. (1996) found that task information feedback (showing the underlying structure of the task) with or without cognitive feedback (prompting on desirable behaviour) gave significantly better forecasting performance than the baseline simple outcome feedback. Adding cognitive information feedback to task information feedback did not improve forecasting accuracy. The study also found that performance outcome feedback (prompting with graphical indicator or words expressing levels of forecasting accuracy) was not superior to outcome feedback. The results for task and cognitive feedback largely replicated those by Balzer et al. (1992, 1994).

Some studies have found a detrimental effect of feedback on performance. In a complex probability task a large error on a particular trial might imply poor strategy or merely the fact that occasional errors are due to be expected in the probability task. As a consequence, outcome feedback may sometimes have a detrimental effect on strategy selection. Peterson and Pitz (1986) discovered that outcome feedback increased the amount by which the decision maker's estimates deviated from the model. Participants made predictions about a number of games won by a baseball team during the year on the basis of a number of performance indicators. These findings were further reinforced by Arkes et al. (1986) who found that the omission of feedback was effective in raising performance. Those without feedback relied more on helpful classification rule that enabled them to judge well in 70% of their decisions, than those with feedback who tried to outperform the rule and consequently performed worse.

In summary, findings concerning the impact of experience on decision performance in multivariate judgement tasks are mixed and inconclusive. The findings suggest that the quality of performance may be conditional upon the type of feedback, task difficulty, time period, and whether participants are allowed to experiment. Some theorists have suggested that "learning histories that capture past experiences may have a positive effect in terms of building of a better understanding about what works and what does not (Kleiner & Roth, 1998).

## Social Interaction

Decisions in social environments can be made individually or in groups. The literature suggests that people make the majority of important personal decisions individually, but after significant social interaction (Heath & Gonzales, 1995). Individuals often seek to consult with others before deciding what jobs to take, what cars to buy, or what changes to make in their personal life. Managerial decision makers also follow similar interactive procedure when making business decisions. They collect information and opinions from their subordinates, peers and superiors, but make final decisions alone. Because they make their final decisions individually decision makers can use or ignore the information they collect during social interaction. In contrast, group decision making requires groups to reach a consensual decision.

The information exchange model of social process suggests that people interact primarily for the purpose of information collection. Situation-theoretic approach to interaction (Devlin, 1999) assumes that, for most conversations, the aim of each participant is to take new information about the focal object or situation into his or her context. The contextual situations can be represented graphically by ovals on a conversation diagram. The overlapping portions represent the contexts that the participants share. The interaction can be viewed geometrically as a gradual pushing together of the participants' contexts so that the overlapping portion becomes larger. Persuasive arguments perspective (Heath & Gonzales, 1995) assumes that an individual's position on any given issue will be a function of a number and persuasiveness of available arguments. It assumes that individuals come up with a few of arguments of their own, but during interaction they collect novel arguments and may shift their initial opinions. Group decision making approach recognises the collaborative nature of the interaction act and suggests the potential synergy associated with collaborative activity (Marakas, 1999). However, much of earlier research into group interactions questions the relative virtues of collaborative over individual decision making due to groupthink phenomenon. According to Janis (1982) members of the cohesive long-term groups strive for unanimity and do not realistically appraise alternative courses of action. This results in unfavourable outcomes.

It is argued that situations where individual decision makers interact in a social environment but make their own decisions should be free from groupthink-style outcomes. In such situations, interaction is assumed to allow individuals to more accurately assess their information and analysis, and improve individual decision performance. A small number of prior empirical studies investigating the issue indicate inconclusive findings. Heath and Gonzalez (1995) cited some earlier studies where interaction improved accuracy in general knowledge questions (Yates, 1991) and predictions domain (Hastie, 1986). However, their own research showed that individual performance did not improve much after interaction. Two studies on sport predictions showed that interaction did not increase decision accuracy or meta-knowledge (calibration and resolution), while one study found little responsiveness in risky shift dilemmas. Instead, interaction produced robust and consistent increases in people's confidence in their decisions. The authors offered a rationale construction explanation for their findings. It suggests that interaction forces people to explain choices to others and that explanation generation leads to increased confidence.

In contrast, Sniezek and Buckley (1995) reported mixed effects of interaction on individual performance within the judge-advisor system. In a given choice task concerning business events judges provided final team choices and confidence assessments independently or after being advised by two advisors. In particular, dependent judges made decisions as advised, cued judges made own decisions after being advised, and independent judges made initial decisions before and final decisions after being advised. Results showed that the effect of advice was dependent upon advisor conflict. With no-conflict, advice was generally beneficial. When conflict existed, it had either adverse (cued and Dependent) or no effect at all (independent) on judge's final accuracy.

In summary, interaction sometimes had positive, sometimes negative and sometimes no systematic effect on individual performance. The equivocal effects of interaction may be potentially attributed to differences in size of interacting groups, expertise and status of the participants, or the characteristics of the tasks involved. Some studies indicate that as the number of participants increases, the likelihood of discussing unshared information decreases (Stasser et al., 1989). According to recent studies on collaborative problem solving, teams of two people (dyads) are more successful than larger groups (Panko & Kinney, 1992; Schwartz, 1995). It has also been suggested that non-experts who are less informed about a decision problem should be more

responsive to information collected and pooled through interaction (Heath & Gonzalez, 1995).

### Study Focus

The focus of this study is to investigate the two variables of personal experience and social interaction. Specifically, the study will explore whether personal experience of the decision maker gained through task repetition with immediate feedback and from learning history affects individual decision accuracy in a judgemental decision making task. The study will also examine whether, and how, the opportunity for social interaction affects individual decision performance. Finally, it will test the potential interaction effects between personal experience and social interaction.

## RESEARCH METHODOLOGY

### Experimental Task

The experimental task in the current study was a simple production planning activity in which participants made decisions regarding daily production of fresh ice-cream. The participants assumed the role of Production Manager for a fictitious dairy firm that sold ice-cream from its outlet at Bondi Beach in Sydney, Australia. The fictitious company incurred equally costly losses if production were set too low (due to loss of market to the competition) or too high (by spoilage of unsold product). The participants' goal was to minimise the costs incurred by incorrect production decisions. During the experiment, participants were asked at the end of each day to set production quotas for ice-cream to be sold the following day. Before commencing the task, participants had an opportunity to make five trial decisions (for practice purposes only).

To aid their decision making, participants were provided with task relevant variables including actual local demand for product and three contextual factors that emerged as important in determining demand levels: the ambient air temperature, the amount of sunshine and the number of visitors/tourists at the beach. All contextual factors were deemed relatively similarly important. The task provided challenge because it did not stipulate exactly how information should be translated into specific judgement. The participants were provided with the meaningful task context, sequential historic information of task relevant variables to provide some cues to causal relationship, and forecast values of contextual variables to suggest future behaviour. However, they were not given any explicit analysis of the quality of their information, or rules they could apply to integrate the available factual information.

Instead, all participants had an opportunity to learn from own experience through task repetition and from performance history. Each participant was required to make thirty experimental production decisions over a period of thirty consecutive simulated days. While handling the task, different participants had different opportunity for social interaction with others. One half of the participants was required to make decisions independently, without any interaction with others. The other half was encouraged to share their information and opinions. More specifically, participants from this group were placed in groups of two and instructed to discuss their information and opinions before making their final decisions. However, they were not required to reach a consensual decision.

At the beginning of the experiment, task descriptions were provided to inform participants about the task scenario and requirements. The given text differed with respect to the form of communication allowed. In addition, throughout the experiment instructions and immediate performance feedback as well as the history of past errors were provided to each participant to analyse earlier performance and to adjust future strategies.

### Experimental Design and Variables

A laboratory experiment with random assignment to treatment groups was used, since it allowed greater experimental control. This made it possible to draw stronger inferences about causal relationships between variables due to high controllability. Independent variables were (i) *personal experience* (earlier phase vs later phase) and (ii) *social interaction* (constrained interaction vs encouraged interaction).

In order to explore learning from personal experience, experimental trials were divided into two blocks of trials referred to as phases. Each phase was equivalent to a block of fifteen trials. Block 1 (or earlier phase) consisted of subjects' first 15 trials, while block 2 (or later phase) consisted of their last 15 trials. Social interaction was manipulated by completely constraining or maximally encouraging (through dialogue) sharing of ideas and information during decision making.

Decision performance was evaluated in terms of decision accuracy operationalised by *absolute error* (AE) and *symmetric absolute percentage error* (SAPE). Absolute error was calculated as an absolute difference between the units of sales produced and the units of the product actually demanded (in hundreds of sale units). Symmetric absolute percentage error was obtained by further dividing the absolute error by an average of produced and demanded values and multiplying by 100%. These measures have been suggested by forecasting literature (Makridakis & Wheelwright, 1989; Makridakis, 1993). Percentage error is generally preferred to absolute error because it controls for scale.

**Participants and Procedure**

The participants were 28 graduate students enrolled in the Master of Commerce course at The University of New South Wales, Sydney. Students participated in the experiment on a voluntary basis and received no monetary incentives for their performance. Generally, graduate students are considered to be appropriate participants for this type of research (Ashton & Kramer, 1980; Remus, 1996; Whitecotton, 1996). The experiment was conducted in a microcomputer laboratory. On arrival, participants were assigned randomly to one of the treatment groups by picking up a diskette with an appropriate version of the research instrument. The instrument was specifically developed by one of the authors in Visual Basic. Students were briefed about the purpose of the study, read case descriptions and performed the task. The session lasted about one hour.

## RESULTS

The impact of personal experience and social interaction on individual performance was analysed statistically using the T-test method. A series of tests were performed to examine simple main effects of independent factors on two performance measures (absolute error and percentage error). Results are presented in Tables 1 and 2.

**TABLE 1**
**PERSONAL EXPERIENCE EFFECTS**

| Social Interaction | Constrained | | | | Encouraged | | | |
|---|---|---|---|---|---|---|---|---|
| Personal Experience | Earlier (N=210) | Later (N=210) | | | Earlier (N=210) | Later (N=210) | | |
| Dependent Variable | Mean (std) | Mean (std) | t | p | Mean (std) | Mean (std) | t | p |
| Absolute Error ('00) | 4.06 (4.20) | 3.62 (4.01) | 1.10 | .273 | 3.38 (3.23) | 2.33 (2.00) | 4.01 | .000** |
| Percentage Error (%) | 19.25(25.16) | 16.36 (21.59) | 1.27 | .207 | 13.56 (11.25) | 9.28 (8.24) | 4.45 | .000** |

* p < 1.00 ** p < .05

**TABLE 2**
**SOCIAL INTERACTION EFFECTS**

| Personal Experience | Earlier | | | | Later | | | |
|---|---|---|---|---|---|---|---|---|
| Social Interaction | Constrained (N=210) | Encouraged (N=210) | | | Constrained (N=210) | Encouraged (N=210) | | |
| Dependent Variable | Mean (std) | Mean (std) | t | p | Mean (std) | Mean (std) | t | p |
| Absolute Error ('00) | 4.06 (4.20) | 3.38 (3.23) | 1.87 | .062* | 3.62 (4.01) | 2.33 (2.00) | 4.20 | .000** |
| Percentage Error (%) | 19.25(25.16) | 13.56 (11.25) | 2.99 | .003** | 16.36 (21.59) | 9.28 (8.24) | 4.44 | .000** |

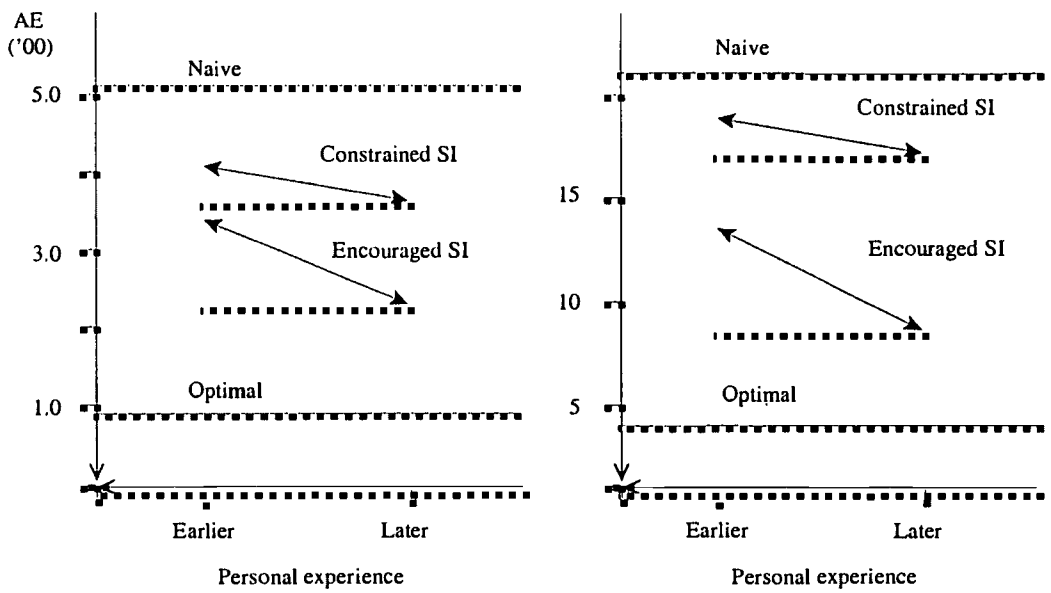
* p < 1.00 ** p < .05

With respect to personal experience, results of the analyses performed indicate mixed effects. In particular, Table 1 shows no significant impact of experience on individual performance in a constrained interaction condition. Although participants' decision errors tended to decrease slightly from earlier to later phase, the change was not statistically significant in either mean absolute error (4.06 vs 3.62, ns) or percentage error (19.25 vs 16.36, ns). On the other hand, Table 1 shows a significant positive effect of increased level of experience on individual performance in the encouraged social interaction condition. There was a significant decrease in participants' decision errors from earlier to later phase both in terms of absolute error (3.38 vs 2.33, $t=4.01$, $p< .05$) and percentage error (13.56 vs 9.28, $t=4.45$, $p< .05$). The results indicate that participants tended to learn over time and improve performance when encouraged to interact with others.

With respect to the simple effects of social interaction, results of the analyses performed indicate that interaction with others had a substantial beneficial impact on participants' performance irrespective of experience. Table 2 reveals significant positive effects of social interaction on decision errors in both earlier and later phases. The mean absolute error of the participants in the encouraged interaction group was significantly smaller than that of their counterparts in the constrained interaction group in earlier (3.38 vs 4.06, $t=1.87$, $p<1.00$), as well as later (2.33 vs 3.62, $t=4.20$. $p<.05$) period. Similarly, the participants in the encouraged interaction group had significantly smaller percentage errors than their counterparts in the constrained interaction group, both in earlier (13.56 vs 19.25, $t=2.99$, $p<.05$) and later (9.28 vs 16.36, $t=4.44$, $p<.05$) phases of the task.

Results of the analysis performed are further presented graphically in Figure 1. In addition to error scores of actual participants by experimental conditions, the figure also includes the corresponding errors of notional naive and optimal decision makers. These are error scores that would have been obtained by people who produced their decisions by using naive and optimal strategies for task performance. These scores were used to assess how much of the theoretically possible potential of information to improve performance was used by the actual participants.

**FIGURE 1**
**INDIVIDUAL DECISION PERFORMANCE BY PERSONAL EXPERIENCE**



The analysis shows a significant difference in the mean absolute error scores between actual participants and notional naives (4.06 vs 5.18, t=2.99, p< .05) in the earlier phase and constrained interaction condition. There was also a slight, but not significant difference in the mean percentage error scores (21.68 vs. 19.25, t=1.23, ns). The participants tended to make smaller than naive decision errors as a result of using some of the potential of their available information to improve performance irrespective of experience and interaction condition.

The analysis further shows a significant difference in the mean absolute error scores between actual participants and notional optimals (2.33 vs 0.87, t=9.87, p< .05) in the later phase and encouraged interaction condition. There was also a significant difference in the mean percentage error scores (9.28 vs 3.56, t=9.31, p< .05). The participants tended to make significantly greater decision errors than they theoretically could have with the available information, irrespective of experience and interaction condition.

## DISCUSSION

The findings of this study provide qualified support for the proposition that a knowledge management initiative such as providing an opportunity for independent experiential learning will enhance individual working knowledge and improve performance in a non-deterministic decision making task context. Beneficial effect of greater experience was evident only in the interactive environment. A knowledge management initiative aimed at encouraging information sharing through social interaction was usefulness and enhanced performance irrespective of experience.

With respect to personal experience, the findings of the current study indicate that its impact on performance was contingent upon social interaction. Contrary to theoretical expectations, the current study found no significant improvement in individual performance with experience in the non-interactive environment. Although participants in the non-interactive group tended to make slightly smaller decision errors in the later than in the earlier phase of the task, the change was not statistically significant. The lack of significant learning and performance improvement found in the non-interactive decision making environment is not surprising. It is consistent with a large body of knowledge accumulated from judgement and decision making research involving non-deterministic multi-variate tasks with or without feedback (for review see Brehmer, 1980).

It seems that the history of past errors expected to help learning (Kleiner & Roth, 1998) could not provide the participants with the information as to what works and what does not in the context of a non-deterministic task. The same decision error could be produced by many different misapprehensions about the relations between the task variables. According to Brehmer (1980) people can not learn probabilistic relations because they assume that the variables are related by deterministic rule. However, the fact that the participants responded in the appropriate direction suggests that they could potentially achieve significant improvement if given more trials. The results from the cue discovery tasks (Klayman, 1988) indicate that it was possible to accomplish cue discovery gradually over a larger number of trials (ranging into the hundreds).

Contrary to most previous research, the current study has demonstrated a substantial beneficial effect of increased experience on decision accuracy in the interactive decision making environment. Participants who interacted with others while handling the decision problem tended to exhibit significant learning over time which led to improved quality of their decisions. This was demonstrated by significantly smaller absolute and percentage errors found among these participants in the later than in the earlier period of the task This is an important finding. It suggests that social interaction enhanced learning. These participants were able to learn better how to use their available information to improve performance. As a result, they tended to make more accurate decisions. It is possible that the opportunity to discuss various aspects of the task with others helped the participants better assess the quality of the available information and evaluate their tentative prediction strategies. It could also help them perceive the task as less complex.

Indeed, the current study has demonstrated that social interaction had a beneficial effect on individual performance irrespective of experience. More specifically, encouraged social interaction led to improved decision accuracy in both earlier and later stages of the task. When participants were allowed to interact and share ideas with others while handling the decision problem, they were found to make smaller decision errors (absolute and percentage) than when they performed the same task without such interaction. This

was true in both less and more experienced stages of the task.

The beneficial effect of social interaction evident in this study is consistent with the theoretical expectations suggested by the knowledge management literature (Garvin, 1998; Nonaka & Takeuchi, 1995). It also agrees with numerous anecdotal evidence from the real world organisations (Hewson, 1999). However, the results obtained in this study contradict findings by Heath and Gonzalez (1995) who investigated the issue in the similarly complex predictive task domain in study 2. The difference between the two findings can be potentially attributed to the characteristics of the task context in which the investigation was carried out. Different from Heath and Gonzalez, the current study provided participants with immediate performance feedback. Earlier empirical research indicated beneficial effect of feedback on learning (Kopelman, 1986).

Participants might have brought their personal analysis and know-how to the task, acquired information about their partner's ideas and arguments and considered both in making final decisions. Immediate performance feedback might have enabled participants to evaluate their own ideas against those of their partners or jointly generated ones, and adjust future strategies accordingly. Generating and sharing personal tacit knowledge through interaction coupled with the opportunity to test its contribution to performance over time might have enhanced learning and resulted in greater accuracy.

The current study also tried to avoid a potential adverse effect of advisor-conflict by limiting individual's social interaction to one other person. Sniezek and Buckley (1995) reported that in a two-advisor system with conflict, advice did not improve judge's accuracy and resulted in deteriorated performance in some cases. In addition, the participants in the current study had dual judge-advisor roles. Because of their equal status in the interactive act, it is possible that the participants jointly generated some new ideas previously non-existent in their individual contexts. Previous research indicated that teams of two people were successful in performing collaborative activities (Panko & Kinney, 1992; Schwartz, 1995).

With respect to overall performance, the study revealed significant improvement in decision accuracy over naive strategy across all treatments. This was demonstrated by significantly smaller decision errors found among actual participants than their notional naive counterparts. The results suggest that people need very little experience (eg. just an initial short practice) with the task to be able to recognise relevant and valid information as such. As a result they are able to use some of its potential to improve performance. This agrees with some earlier findings (Klayman, 1988) indicating that while people have difficulties in learning its shape, they are generally able to perceive the existence and direction of a cue-criterion relation.

Unfortunately, the study revealed significant deviations from optimal performance across all treatments. Participants tended to use much less of full information potential and perform much worse than they could have. This was demonstrated by significantly greater decision errors found among actual participants than their notional optimal counterparts. The suboptimal overall performance could be potentially attributed to the lack of monetary incentives. Sniezek and Buckley (1995) provided their students with substantial monetary rewards for their performance. It is possible that without monetary incentives, the participants did not try as hard as possible to use more potential of their information to improve decisions. By not giving extrinsic incentives, this study attempted to prevent information "hoarding", and promote cooperation rather than competition among the participants. It was also assumed that graduates chosen from the pool of students attending an advanced level course should be motivated to do their best on the task by the intrinsic interest for the subject matter.

Alternatively, the failure to achieve optimal performance could be attributed to the characteristics of the task information. Information repositories available to participants in the current study contained only factual information with little analysis, and had no procedural information. Acquiring "explicit factual knowledge was not sufficient to perform well on the task. The participants needed also analytical information such as evaluation of predictive validity of each contextual factor, as well as the relevant know-how to integrate factual information into a decision response. This crucial information was assumed to be a part of individual "tacit knowledge acquired from experience and social interaction. However, it is possible that non-expert participants needed to either interact with experts or be given more time to develop higher levels of the required "tacit knowledge to perform well on the task.

While the current study provides a number of interesting findings, some caution is necessary regarding their generalisability due to a number of limiting aspects. One

of the limitations refers to the use of a laboratory experiment that may compromise external validity of research. Another limitation relates to artificial generation of information that may not reflect the true nature of real business. The participants chosen for the study were students and not real life decision makers. The fact that they were mature graduates may mitigate the potential differences. No incentives were offered to the participants for their effort in the study. Consequently, they could find the study tiring and unimportant and would not try as hard as possible. Most decisions in real business settings have significant consequences.

Although limited, the findings of the current study may have some important implications for organisational knowledge management strategies. They indicate that novice knowledge workers left on their own in working environments that do not encourage culture of sharing are not likely to learn effectively from experience (beyond the initial learning through short practice) and are not likely to further improve performance. Creating working contexts that encourage communication and culture of information sharing among knowledge workers may potentially have a beneficial effect on knowledge creation by speeding up individual learning and resulting in enhanced performance. The findings may also have some important pedagogical implications for distance education, given the growing number of distance learning programmes offered by various university colleges and business schools. In particular, the evidence from this study suggests that support facilities such as groupware systems may be necessary to enable interaction among distance learners to augment their individual experience.

## CONCLUSIONS

The main objective of this study was to investigate the effects of personal experience and social interaction on people's working knowledge and use of that knowledge to improve performance in a specific decision making context. In summary, the findings of the study indicate that increased experience did not result in significant performance improvement of individual decision makers when no opportunity for interaction with others was available. In the interactive environment, increased experience led to enhanced decision accuracy. The findings further indicate a beneficial effect of social interaction on performance irrespective of decision makers' experience. The encouraged social interaction was useful at both low and high experience stages of the task and resulted in enhanced decision accuracy when compared to constrained interaction. These findings may have important implications for knowledge management, as they reveal synergy of the two combined factors in effective knowledge creation and subsequent performance improvements. Further research is required that would extend the study to other participants and environmental conditions in order to ensure the generalisability of the present findings.

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